

FIELD TEST: RESULTS FROM THE ONE YEAR MISSION

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INTRODUCTION

The *One Year Mission* was designed to aid in determining the effect that extending the duration on orbit aboard the International Space Station (ISS) would have on a number of biological and physiological systems. Two crewmembers were selected to participate in this endeavor, one U.S. On-Orbit Segment (USOS) astronaut and one Russian cosmonaut. The Neuroscience and Cardiovascular and Vision Laboratories at the Johnson Space Center and the Sensory-Motor and Countermeasures Division within the Institute for Biomedical Problems were selected to investigate vestibular, sensorimotor and cardiovascular function with the two long-duration crewmembers using the established methodology developed for the *Field Test* (FT).

RESEARCH

The FT data were collected several times before flight for both crewmembers to determine baseline levels of performance. For the USOS crewmember, data were collected again postflight three times within the first 24 hr after landing (at the landing site <2 hr post landing in the medical tent at the landing site, approximately 12 hr later at a refueling station on a direct return to JSC and about 24 hr post landing at JSC) as well as on 1, 4, 6, 15 and 30 days after landing. The Russian crewmember was tested once at the landing site and later on 3, 7 and 12 days after landing. Assessing both sensorimotor and cardiovascular research goals, the FT is composed of a set of tests that include: (1) a sit-to-stand test, (2) recovery from a fall with stand test where the crewmember begins in the prone position on the ground and then stands for 3.5 minutes while cardiovascular performance and postural ataxia data are acquired, (3) a tandem heel-to-toe walk test to determine changes in the central locomotor program, (4) walking and obstacle avoidance, (5) muscle compliance, (6) postural adjustments to perturbations (pushes) applied to the subject's chest area and (7) center of mass/pressure measurements made across most test objectives with wireless insoles inserted into the subjects' shoes, (8) dynamic visual acuity, (9) fine motor control, (10) jumping from a 30 cm platform, (11) cerebellar function, (12) force discrimination, (13) eye-hand coordination, (14) computerized dynamic posturography, and (15) rock translation.

SUMMARY

The functional deficits observed for the FT have typically been worse than similar functional studies where data were collected after the initial 24 hr window following a return to Earth. Significant improvement in crew performance has been observed following multiple test sessions within the first 24 hrs, but full recovery has not yet been established for the one year crewmembers. Measureable performance parameters such as ability to perform a seat egress, recovery from a fall or the ability to see clearly and related physiologic data (orthostatic responses) are required to provide an evidence base for characterizing programmatic risks and the variability among crewmembers for exploration missions where the crew will be unassisted after landing. Overall, these early functional and related physiologic measurements will allow the estimation of nonlinear sensorimotor and cardiovascular recovery trends that have not been previously captured.